# Math 250 – Introduction to Linear Algebra – Section 11
# Instructor Pat Devlin – Spring 2013

Updated February 12, 2013

**Text:** Spence, Insel & Friedberg *Elementary Linear Algebra: A Matrix Approach, 2nd Edition*
ISBN # 978-0-13-187141-0, Prentice-Hall, Upper Saddle River, NJ 07458

This is a tentative syllabus for the course. Time permitting, we will cover additional topics including applications of linear algebra and perhaps topics from chapter 7. There are weekly quizzes in class and weekly homework assignments (see Sakai page). The exams will be cumulative. Topics in *italics* may be omitted. The exact structure of the course may vary.

## Syllabus

| Lecture | Reading | Topics |
|---|---|---|
| 1 | 1.1, 1.2 | Matrices, Vectors, and Linear Combinations |
| 2 | 1.3 | Systems of Linear Equations via Matrices |
| 3 | 1.3, 1.4 | Reduced Row Echelon Form and Gaussian Elimination |
| | App. E | Uniqueness of Reduced Row Echelon Form |
| 4 | 1.4, 1.6 | Properties of Rank; Span of a Set of Vectors |
| 5 | 1.6, 1.7, 4.1 | Geometry of Span, Linear Dependence and Linear Independence, Introduction to Bases, and Introduction to Subspaces |
| 6 | 4.1, 4.2 | Subspaces, Null Space and Column Space of a Matrix, Connections Between Geometry of the Columns of a Matrix (e.g., Linear Independence and Span) and its Rank |
| | App. A | Sets (the symbols $\mathbb{R}$, $A \subseteq B$, $x \in S$, and [ideally] notation such as $\{x \in \mathbb{R} \ : \ x^2 > 1\}$) |
| 7 | 4.2 | Basis and Dimension |
| 8 | 2.1, 2.7 | Linear Transformations, Matrices as Functions |
| | App. B | Functions (domain, codomain [range], image, coposition, one-to-one, onto, invertibility, and inverses) |
| 9 | 2.1, 2.8 | Composition of Linear Transformations, Matrix Multiplication |
| 10 | 2.3, 2.4, 2.8 | Invertibility, Matrix Inverses, Inverses of Linear Transformations |
| ? | 2.5 | *Partitioned Matrices and Block Multiplication* |
| ? | 2.6 | *LU Decomposition of a Matrix* |
| ? | 7.1-7.4 | *General Vector Spaces* |
| 12 | 4.3 | Dimension of Fundamental Spaces, Rank-Nullity Theorem |
| 13 | 4.4 | Change of Basis, Similar Matrices |
| 14 | | Catch Up and Review |
| 15 | **Midterm Exam**[1] | |
| 16 | 3.1 | Determinants; Cofactor Expansions |
| 17 | 3.2 | Properties of Determinants |
| 18 | 5.1 | Eigenvalues and Eigenvectors |
| 19 | 5.2 | Characteristic Polynomial |
| 20 | 5.3, 6.6 | Diagonalization of a Matrix; Diagonalization of Symmetric Matrices |
| 21 | 5.5 | Examples of Diagonalization |
| 22 | 6.1 | Geometry of Vectors; Projection onto a Line |
| 23 | 6.2 | Orthogonal Sets of Vectors; Gram-Schmidt Process; *QR factorization* |
| 24 | 6.3 | Orthogonal Projection; Orthogonal Complements |
| ? | 6.4 | *Least Squares; Normal Equations* |
| ? | 6.5, 6.6 | *Orthogonal Matrices* |
| ? | 6.6 | *Diagonalization of Quadratic Forms* *Spectral Decomposition for Symmetric Matrices* |
| 28 | | Catch up and review |
| | **Final Exam** | (Class Hour Schedule) |

[1] The midterm exam is Thursday March 14 in class (the class before spring break).